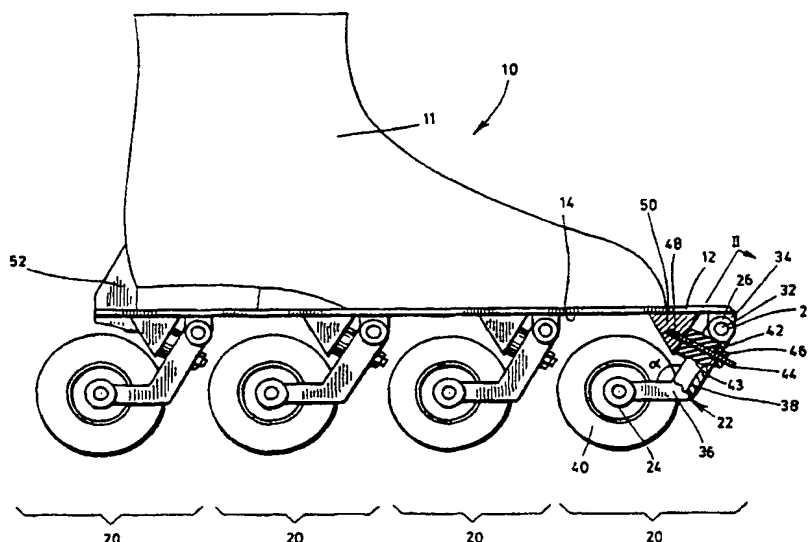


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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/CA96/00548 <b>(22) International Filing Date:</b> 7 August 1996 (07.08.96)  <b>(30) Priority Data:</b> 60/002,182                      9 August 1995 (09.08.95)                      US  <b>(71)(72) Applicant and Inventor:</b> PERLIN, Rafaël [CA/CA]; 103, avenue Fredmir, Dollard-des-Ormeaux, Québec H9A 2R5 (CA).  <b>(74) Agent:</b> ROBIC; 55 Saint-Jacques, Montréal, Québec H2Y 3X2 (CA).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

**(54) Title:** WHEEL ASSEMBLY FOR A ROLLING DEVICE**(57) Abstract**

A plurality of wheel assemblies (20) are connected under a rolling device (10). Each of the wheel assemblies (20) comprises a pivot arm (22) pivotally connected to the bottom surface (14) of a supporting base (12). These arms (22) are allowed to pivot in a substantially vertical plane around a pivot axis. A wheel (40) is operatively connected to one end of the arm (22). A suspension element (42) is snugly interposed between the supporting base (12) and the pivot arm (22) for providing suspension to the rolling device (10). A screw (44) and a nut (46) are provided for holding the suspension element (42) in place and adjusting the compression of the suspension element (42). The rolling device (10) according to the present invention allows high performances and encompasses efficient shock absorption. It also allows the wheels (40) to follow the road profile.

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## WHEEL ASSEMBLY FOR A ROLLING DEVICE

## FIELD OF THE INVENTION

5           The present invention relates to a wheel assembly for  
providing suspension to rolling devices such as roller skates,  
skate boards, educational, hospital, industrial wheeled  
equipments, or the like.

## 10           BACKGROUND OF THE INVENTION

Various types of wheel assemblies have been developed over  
the years for rolling devices such as traditional roller skates,  
skateboards or in-line roller skates, but in general, these  
15 wheel assemblies do not provide an effective suspension to the  
rolling device.

For example, the in-line roller skates known in the prior  
art generally comprise a truck on which wheels are directly  
mounted by means of axles. These roller skates are not provided  
20 with any specially designed suspension means allowing the wheels  
to follow the road contour as the user is skating.

Also known in prior art is the wheel carriage assembly  
described in U.S. Patent no. 4,089,536. This wheel assembly  
comprises a pivot arm which carries wheels and which has an end  
25 provided with a projecting pin which fits in a bore on the  
bottom of a board for pivotal movement against a shock absorber.  
As can be understood, this combination was mainly designed for  
use with skateboards which require good responsiveness during  
change of direction. This combination allows the arm to pivot  
30 about its axis, thereby allowing the wheels to pivot in a  
horizontal plane against the biasing action of the shock  
absorber. One drawback with this wheel assembly from the  
suspension viewpoint is that the combination of the bore adapted  
for receiving the pin allows the arm to pivot only a few degrees  
35 in a vertical plane and thus limits the shock absorption  
performance of the assembly. Therefore, this type of wheel  
assembly does not provide an efficient suspension for the  
skateboard.

## SUMMARY OF THE INVENTION

It is an object of the present invention to provide a rolling device comprising wheel assemblies that provide true and efficient suspension for the device. More particularly, the object of the present invention is to provide a rolling device comprising a supporting base and a plurality of wheel assemblies connected under the supporting base, each of the wheel assemblies comprises:

a pivot arm having a proximal and a distal end relative to a bottom surface of the supporting base;

a hinge means for pivotally connecting the proximal end of the arm to the bottom surface of the supporting base, thereby allowing the arm to pivot in a substantially vertical plane about a pivot axis;

at least one wheel;

a connecting means for operatively connecting the wheel to the distal end of the arm;

a suspension element snugly interposed between the bottom surface of the supporting base and an intermediary location between the proximal and distal ends of the pivot arm for providing suspension to the rolling device; and

a fastening means for holding the suspension element in place and for adjusting a compression thereof.

According to a preferred embodiment, the wheel of each wheel assembly is rearwardly offset with respect to the pivot axis of the corresponding hinge means.

According to another preferred embodiment, the rolling device comprises first and second wheel assemblies having their wheel respectively rearwardly and forwardly offset with respect to the pivot axis of their corresponding hinge means.

The wheel assemblies according to the present invention provide an efficient suspension system to the rolling device, reducing the negative effects of vibration such as fatigue for example.

The rolling device according to the present invention provides a number of positive effects through an efficient suspension system. Among those positive effects, are the following:

a) increased comfort for the user;

- b) decreased fatigue of the user;
- c) reduction of rolling resistance;
- d) better performance for the user;
- e) provision of a better grip to the road, which increases  
5 the safety of the user;
- f) less wear, mainly on the bearings and wheels;
- g) less maintenance;
- h) allowance of the use of smaller and harder wheels for  
comparable performance.

10 A non restrictive description of preferred embodiments  
will now be given with reference to the appended drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

15 FIG. 1 is a side elevational view of an in-line roller  
skate provided with wheel assemblies according to a  
first preferred embodiment of the present invention,  
showing the pivot arm of one wheel assembly in a  
partial cross-sectional view;

20 FIG. 2 is an enlarged cross-sectional view taken along  
line II-II of FIG. 1, showing the shape and layout of  
the pivot arm;

FIG. 3 is a side elevational view of an in-line roller  
skate provided with wheel assemblies according to a  
25 second preferred embodiment of the present invention,  
showing the arms in a partial cross-sectional view;

FIG. 4 is a side elevational view of an in-line roller  
skate provided with wheel assemblies according to a  
30 third preferred embodiment of the present invention,  
showing the arms in a partial cross-sectional view;

FIG. 5 is a side elevational view of a wheel assembly  
according to a fourth preferred embodiment of the  
present invention for use with a rolling device  
provided with a swivelling or fixed caster.

#### DESCRIPTION OF PREFERRED EMBODIMENTS

35 Referring to FIGS. 1 to 5, there are shown four preferred  
embodiments according to the present invention. The same numeral

references are used for describing corresponding elements of each embodiment. As can be seen, the rolling device for the first three embodiments consists of an in-line roller skate 10, whereas the fourth one may be any rolling device provided with a swivelling or fixed caster such as a wheelchair or other educational, industrial or hospital-wheeled equipment. Other embodiments not illustrated and having features of the present invention may also consist of traditional roller skates provided with two pairs of wheels, or other rolling devices such as industrial buggies, shopping carts, etc.

Referring now to FIG. 1, the roller skate 10 comprises a boot 11 secured on top of a supporting base 12 or frame.

A plurality of wheel assemblies 20 are connected under the supporting base 12. The roller skate 10 illustrated is provided with four of these wheel assemblies 20 but may be provided with more or less than four wheel assemblies without departing from the scope of the present invention. Each wheel assembly comprises a pivot arm 22 having a distal end 24 and a proximal end 26 relative to the bottom surface 14 of the supporting base 12. The proximal end 26 which is provided with a transversal hole 28 is pivotally connected to the bottom surface 14 of the supporting base 12 by means of a hinge means. The hinge means preferably comprises a hinge pin 32 mounted within the transversal hole 28 and a bracket or support 34 for transversely connecting the hinge pin 32 to the bottom surface 14 of the supporting base 12. An antifriction bushing (not illustrated) may be provided in each support 34.

Referring now to FIG. 2, a wheel 40 is operatively connected to the distal end 24 of each pivot arm 22 by means of a conventional structure comprising an axletree 41 which does not need to be further described. For traditional roller skates, two wheel assemblies may be set side by side at the front and at the back of the supporting base.

In the preferred embodiment, illustrated in Fig. 1, the wheel 40 of each assembly is rearwardly offset with respect to the pivot axis of the hinge pin 32 and each pivot arm 22 includes a distal segment 36 and a proximal segment 38. The distal segment 36 extends substantially parallel to the

supporting base 12 and defines an angle " with the proximal segment 38 of the arm 22.

Each wheel assembly further includes a suspension element 42 snugly interposed between the bottom surface 14 of the supporting base 12 and the proximal segment 38 of the arm 22. The proximal segment 38 is preferably provided with a slot 43 for receiving a bottom end of the suspension element 42 therein. This slot 43 allows the arm to pivot without interfering with the screw 44 and it allows also allows a linear adjustment of the suspension element 42. The suspension element 42 is preferably made of a resilient material such as rubber or polyurethane and is provided with a longitudinal hole. A steel spring may also be used as a suspension element.

The suspension element 42 is held in place by means of a screw 44 and a nut 46. The screw 44 is inserted in the suspension element 42 through the longitudinal hole thereof. One end of the screw 44 is received in a threaded hole 48 provided in an angulated element 50 projecting from the bottom surface 14 of the supporting base 12. The compression of the suspension element 42 is adjusted by turning the corresponding nut 46. Advantageously, the nut 46 may be provided with clicking means allowing an adjustment of the suspension element 42 at preselected compression stresses.

Referring now to FIGS. 3 and 4, there are shown two other preferred embodiments of the present invention. In these embodiments, the roller skate is provided with first and second wheel assemblies 20a), 20b) having their wheels 40a), 40b) respectively rearwardly and forwardly offset with reference to the pivot axis of their corresponding hinge pin 32. As illustrated, the pivot arm 22 of each assembly is connected to the same hinge pin 32 and is thus allowed to pivot around a same pivot axis. The pivot arms 22 of the embodiment shown in FIG. 3 are operating independently of each other while the ones of the embodiment shown in FIG. 4 are rigidly connected to each other and their movements are thus mutually dependent. One wheel assembly is illustrated in FIG. 4 but in another preferred embodiment (not illustrated), the rolling device may be provided with two or more of such wheel assemblies, thereby allowing to use four or more wheels on one rolling device.

Preferably, in these embodiments, the proximal segment 38 of each pivot arm 22 extends substantially parallel to the bottom surface 14 of the supporting base 12. The distal segment 36 of each arm 22 defines an angle " with the proximal segment 38 so that the former projects away from the supporting base 12. Stoppers 56 are provided on the upper face of each proximal segment 38 for limiting the stroke of the wheel 40 and preventing any contact between the wheel 40 and the bottom surface 14 of the supporting base 12.

Preferably, as illustrated, each embodiment of the present invention may be provided with a brake 52 connected at the rear end thereof and with a skirt (not illustrated) in order to hide the supporting base 12 and the hinge means. Referring to Fig. 5, there is shown another preferred embodiment of the present invention. In this embodiment, the rolling device may be a wheelchair, a cot or any wheeled equipment provided with a swivelling or fixed caster 58 operatively connected to the distal end of the pivot arm 36.

The wheel assembly provided with the rolling devices according to the present invention is thus believed to be very advantageous over conventional rolling devices such as roller skates and the like where the wheel assemblies provided therewith do not allow an efficient suspension. In the present invention, the shock absorption capacity of the rolling device is believed to be improved by the fact that, for each wheel assembly, the arm on which the wheel is connected is allowed to sufficiently pivot in a vertical plane against the suspension element.

Although preferred embodiments of the invention have been described in detail herein and illustrated in the accompanying drawings, it is to be understood that the invention is not limited to these precise embodiments and that various changes and modifications may be effected therein without departing from the scope or spirit of the invention.



## WHAT IS CLAIMED IS:

1. A rolling device (10) characterized in that it comprises:
  - a supporting base(12) having a bottom surface (14);
  - a plurality of wheel assemblies (20) connected under the supporting base (12), each of said wheel assemblies (20) comprising:
    - a pivot arm (22) having a proximal and a distal end (26, 24) relative to the bottom surface (14) of the supporting base (12);
    - hinge means for pivotally connecting the proximal end (26) of the arm (22) to the bottom surface (14) of the supporting base (12), thereby allowing the arm (22) to pivot in a substantially vertical plane around a pivot axis;
    - at least one wheel (40);
    - connecting means for operatively connecting said wheel (40) to the distal end (24) of the arm (22);
    - a suspension element (42) snugly interposed between the bottom surface (14) of the supporting base (12) and an intermediary location between the proximal and the distal ends (26,24) of the pivot arm (22) for providing suspension to the rolling device (10); and
    - fastening means for holding the suspension element (42) and for adjusting a compression thereof.
2. A rolling device (10) as claimed in claim 1, characterized in that, for each of the wheel assemblies (20), the hinge means comprises:
  - a hinge pin (32) mounted within a transversal hole (28) provided at the proximal end (26) of the pivot arm (22); and
  - a bracket means for remotely and transversely connecting said hinge pin (32) to the bottom surface (14) of the supporting base (12).

3. A rolling device (10) as claimed in claim 2, characterized in that, for each of the wheel assemblies (20), said intermediary location of the arm (22) is provided with a slot (43) for receiving a bottom end of the suspension element (42) and allowing a linear adjustment thereof.
4. A rolling device (10) as claimed in claim 3, characterized in that, for each of the wheel assemblies (20), the wheel (40) is rearwardly offset with respect to the pivot axis of the corresponding hinge means.
5. A rolling device (10) as claimed in claim 4, characterized in that each of the suspension elements (42) is made of a resilient material.
6. A rolling device (10) as claimed in claim 5, characterized in that it further comprises a boot (11) securable on top of the supporting base (12).
7. A rolling device (10) as claimed in claim 6, characterized in that, for each of the wheel assemblies (20), the pivot arm (22) comprises a distal and a proximal segment (36,38) relative to the bottom surface (14) of the supporting base (12) and defining an angle with respect to each other, the distal segment (36) extending substantially parallel with the supporting base (12).
8. A rolling device (10) as claimed in claim 2, characterized in that the rolling device (10) comprises:
- a first and a second wheel assembly (20a,20b), each of said assemblies (20a,20b) having their wheel (40) respectively rearwardly and forwardly offset with respect to a pivot axis of their corresponding hinge means.
9. A rolling device (10) as claimed in claim 8, characterized in that said first and second assemblies (20a,20b) have a common hinge means allowing their arm (22) to pivot around a same pivot axis.

10. A rolling device (10) as claimed in claim 9, characterized in that each of the suspension elements (42) is made of a resilient material.

11. A rolling device (10) as claimed in claim 10, characterized in that it further comprises a boot (11) securable on top of the supporting base (12).

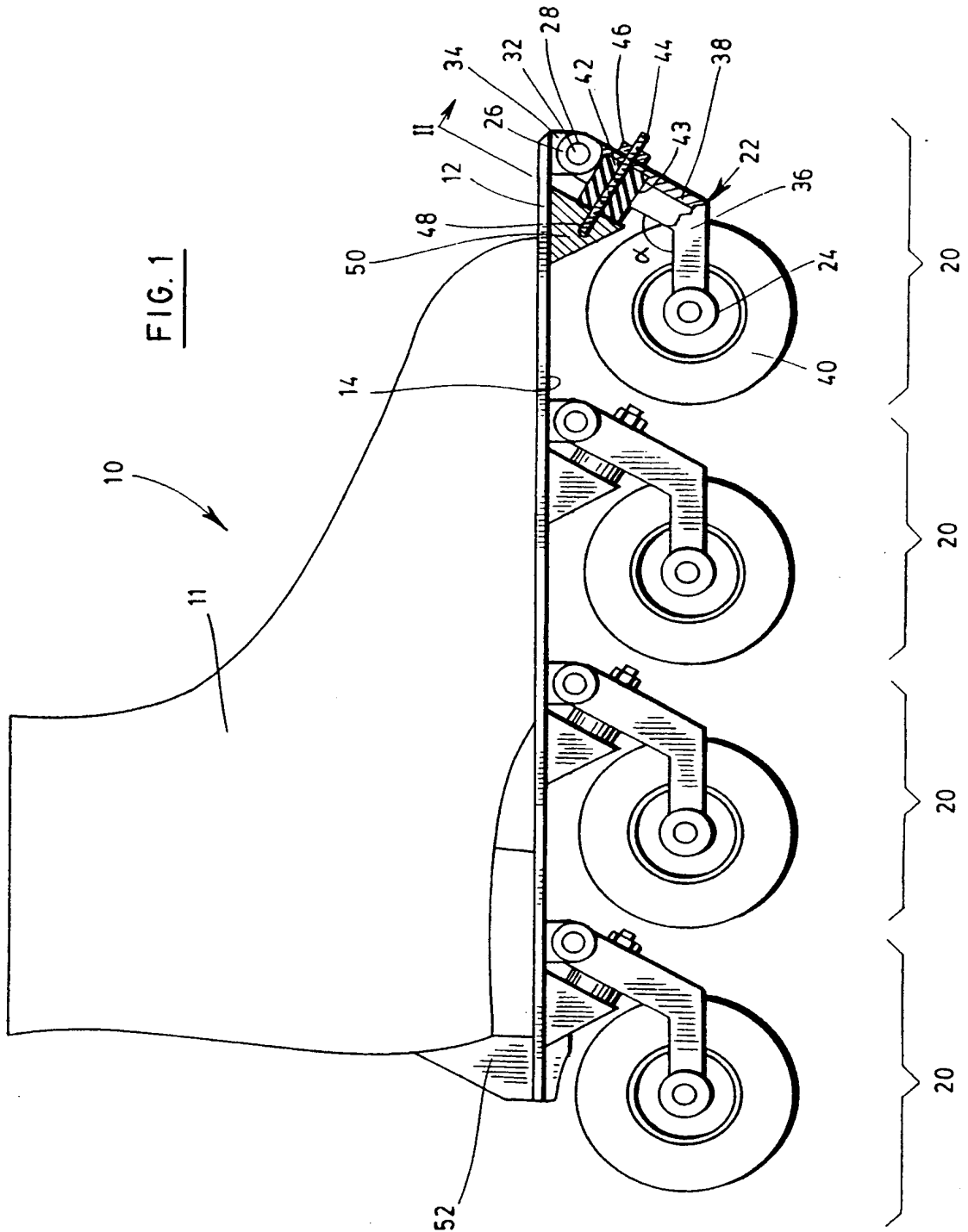
12. A rolling device (10) as claimed in claim 11, characterized in that, for each of the wheel assemblies (20a,20b), the corresponding pivot arm (22) comprises a proximal and a distal segment (38,36) relative to the bottom surface (14) of the supporting base (12) and defining an angle with each other, said proximal segment (38) extending substantially parallel to said bottom surface (14) and said distal segment (38) projecting away therefrom.

13. A rolling device (10) as claimed in claim 12, characterized in that the arms (22) of the first and the second assemblies (20a,20b) are rigidly connected together.

14. A rolling device (10) as claimed in claim 1, characterized in that it further comprises:

clicking means for allowing an adjustment of the suspension element (42) at preselected compression stresses.

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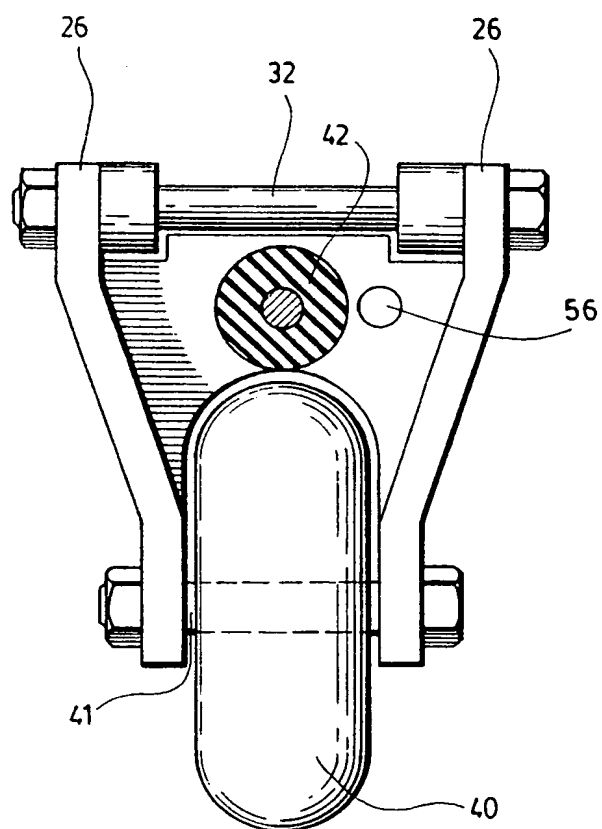
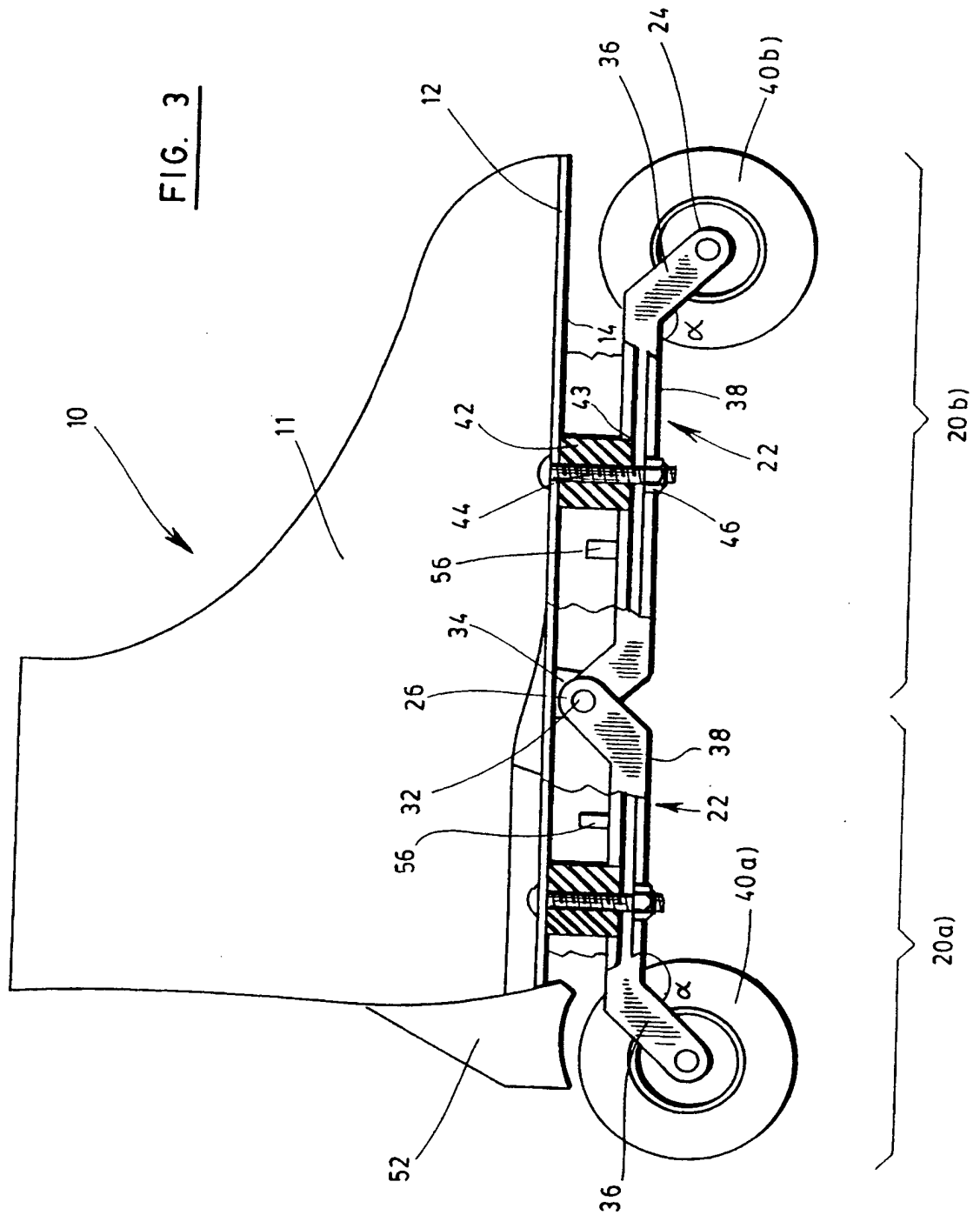


FIG. 2

FIG. 3





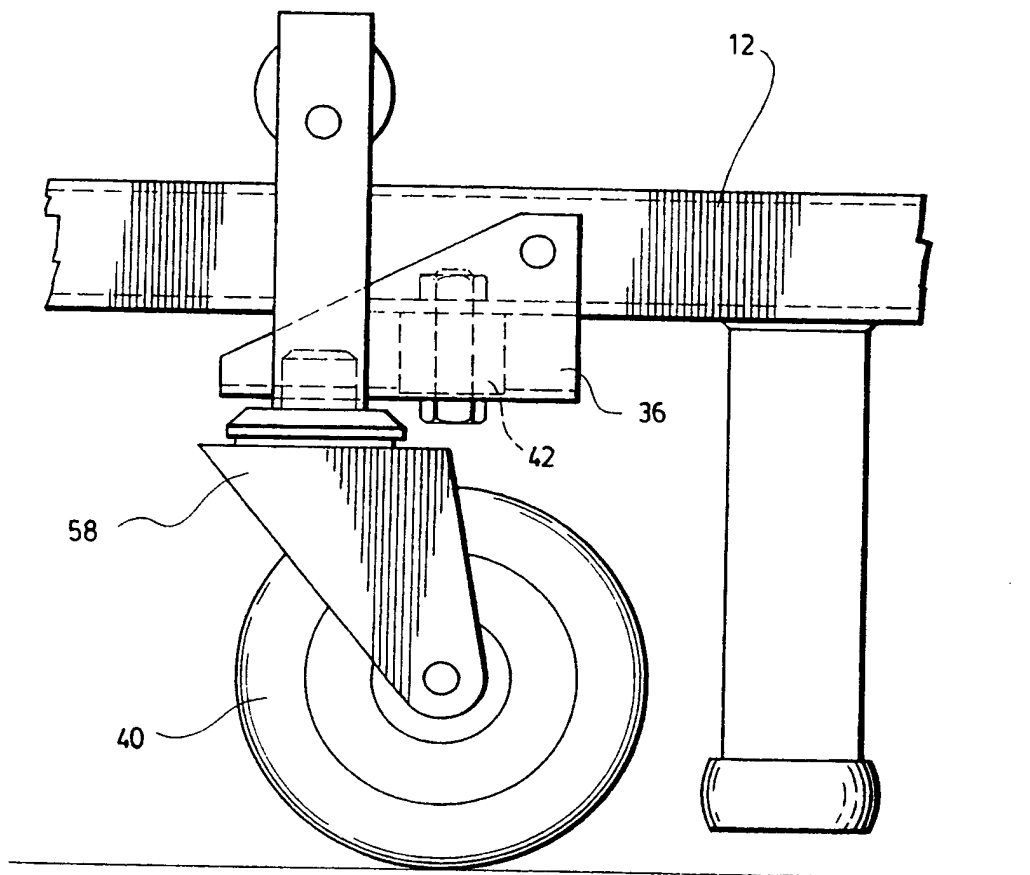


FIG. 5



# INTERNATIONAL SEARCH REPORT

1

International application No.

PC1/CA 96/00548

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A63C 17/06, A63C 17/01

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO, A1, 9312847 (NORDICA S.P.A.), 8 July 1993 (08.07.93), page 5, line 15 - page 6, line 9, figures	1-3,8-12
Y	--	4-7
X	WO, A1, 9312846 (NORDICA S.P.A.), 8 July 1993 (08.07.93), page 5, line 27 - page 6, line 2, figures	1-3,8
Y	--	4-7
Y	US, A, 2552987 (F. LOERTZ, JR), 15 May 1951 (15.05.51), column 3, line 13 - line 30, figures	4-7
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Y

WO, A1, 9314840 (NORDICA S.P.A.), 5 August 1993  
(05.08.93), figures

7

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

01/10/96

International application No.

PCT/CA 96/00548

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 9312847	08/07/93	AU-A- 3256693 EP-A- 0572622 IT-B- 1253666 IT-D- TV910126	28/07/93 08/12/93 22/08/95 00/00/00
WO-A1- 9312846	08/07/93	AU-A- 3158193 IT-B- 1253667 IT-D- TV910127	28/07/93 22/08/95 00/00/00
US-A- 2552987	15/05/51	NONE	
WO-A1- 9314840	05/08/93	AT-T- 139456 AU-A- 3351993 CA-A- 2107347 DE-D- 69303235 EP-A,B- 0578800 IT-B- 1257578 IT-D,V- TV920013 US-A- 5405156	15/07/96 01/09/93 01/08/93 00/00/00 19/01/94 01/02/96 03/03/92 11/04/95

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